VOLUME 4, ISSUE 1

WINTER 2009-2010

INSIDE THIS ISSUE:

Happy

HOLIDAYS

www.weather.gov/bgm

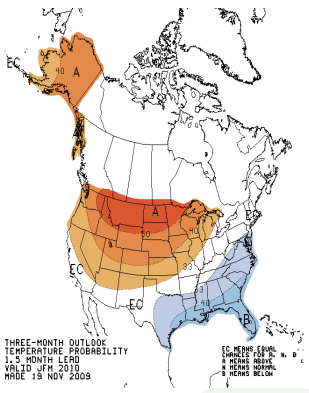
Nor'easter

National Weather Service Binghamton, NY

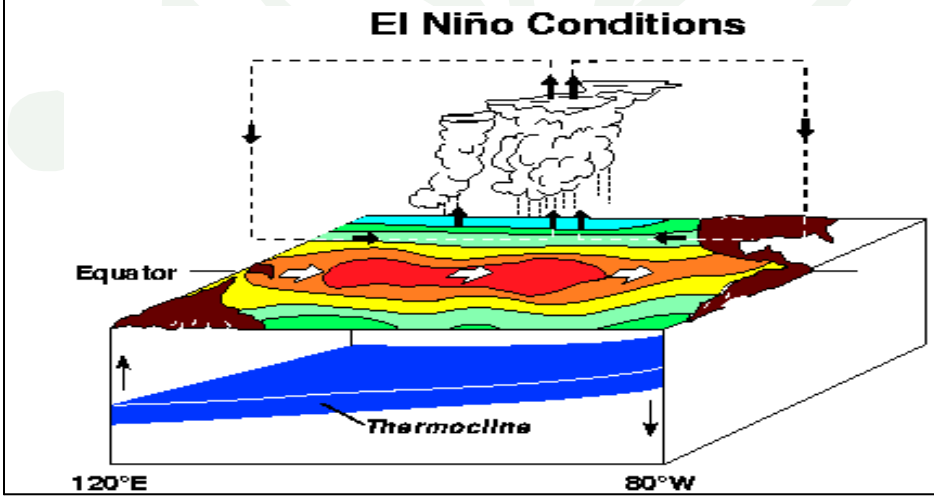
OUTLOOK FOR JANUARY-FEBRUARY-MARCH 2010

NOAA's Climate Prediction Center's outlook for January-February-March 2010 is calling for above to much above normal temperatures over the north central and northwest United States with normal temperatures from New England through New York and northern Pennsylvania to the lower Ohio Valley, southern Plains and southwest United States. Below normal temperatures are expected across the Middle Atlantic States, the southeast and Gulf States (see image below).

The primary factor that will influence our winter is the El Nino in the Pacific Ocean. El Nino is a naturally occurring phenomena in the Pacific Ocean in which the ocean water temperatures become warmer than normal over the central and eastern equatorial Pacific Ocean The warmer waters allow big thunderstorms to shift eastward into the central and, during strong El Ninos, the eastern Pacific (see image below).



This shifting pattern of thunderstorms increases the intensity of the subtropical and Pacific jet stream which has profound influences on the winter in the United States. The increase in the subtropical and Pacific jet streams tends to flood the lower 48 states with milder Pacific air. Pacific air masses tend to dominate more so than colder Canadian air masses leading to milder conditions across the northern United States where Canadian air masses are most common. In the southeast U.S, the active jet stream pattern leads to cooler conditions because it becomes wetter, with increased storm activity and more clouds. See image on page 2.

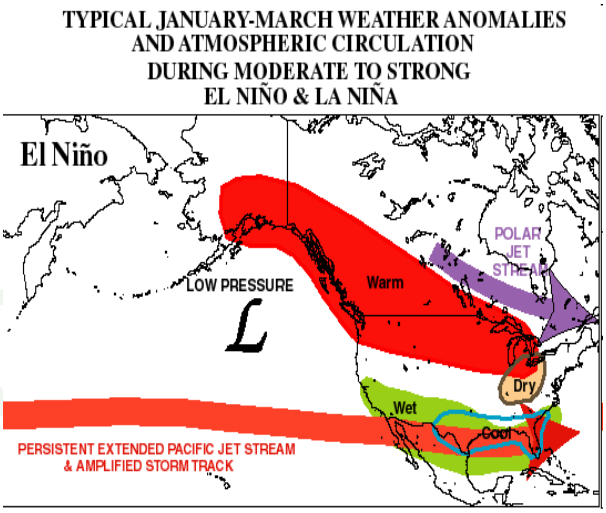


THE OUTLOOK FOR JANUARY-FEBRUARY-MARCH 2010

In the northeast U.S, the resultant winter is often related to the strength of El Nino. During weaker and even some moderate El Ninos, the pacific air masses are not frequent enough to outmuscle the influx of Arctic air masses to the northeast U.S. Strong El Ninos will tend to overpower arctic masses and lead to mild conditions even for the northeast. A common theme for most of the eastern, southern and west coasts, is more storminess. The active subtropical and pacific jet streams will make for an active winter season. Along the middle Atlantic and northeast U.S. this means a better chance of getting a big nor'easter with lots of snow. So if you are one who likes big old-fashioned snowstorms, this might be your winter.

For more information on El Nino's influence on the upcoming winter see:
http://www.noaanews.noaa.gov/stories2009/20091015_winteroutlook.html

For more info on El Nino go to the following webpage:
http://www.elnino.noaa.gov



WINTER WEATHER SAFETY AND TERMINOLOGY

With colder weather, snow and ice right around the corner, it is a good time to review basic winter weather safety tips.

When roads are snow and/or ice covered, slow down and allow extra time to reach your destination. This is *very important* because the leading cause of death during winter storms is transportation accidents! Prepare your vehicle for the winter season and know how to react if stranded or lost on the road. If you are a frequent traveler through the region, the best way to prepare for winter storms is to have a winter storm survival kit in your vehicle. A winter storm survival kit should consist of the following: blankets/sleeping bags flashlight with extra batteries, first-aid kit, knife, high-calorie non-perishable food, extra clothing, large empty can and plastic cover with tissues and paper towels for sanitary purposes, a smaller can and water-proof matches to melt snow for drinking water, sack of sand (or cat litter), shovel, windshield scraper and brush, tool kit, tow rope, booster cables, water container, compass and road maps. Keep your gas tank near full to avoid ice in the tank and fuel lines. Try not to travel alone. Let someone know your timetable and primary and alternate routes.

At home and at work, primary concerns during a winter storm are the potential loss of heat, power, telephone service, and a shortage of supplies if storm conditions continue for more than a day. Have available: flashlight and extra batteries, battery-powered NOAA Weather Radio and a portable radio to receive emergency information. These may be your only links to the outside. Other items to have available: extra food and water, extra medicine and baby items, first-aid supplies, heating fuel, emergency heating source, such as a fireplace, wood stove, space heater, etc.

Winter Storm Survival Kit	
Blanket	**Extra Clothes**
Flashlight	**Empty Can w/ Plastic Cover**
Batteries	**Paper Towels**
First-Aid Kit	**Matches**
Knife	**Sack of Sand**
Non-perishable Food	**Snow Brush**
Shovel	**Booster Cables**
Tool Kit	**Water Container**
Tow Rope	**Road Maps**
Compass	

It is also important to understand and know about winter storm terminology. A **winter storm watch** means that conditions are favorable for severe winter weather conditions in your area. This includes heavy snow, damaging ice accumulations or a combination of heavy snow, and ice. In addition, high winds, blowing and drifting snow and bitterly cold wind chills are also possible. The key word here is POSSIBLE. A winter storm watch means that a winter storm is possible but not certain. There still is a 50 percent chance that the storm could miss your area. However, the threat of the storm is high enough so that residents should be "watching out" for the storm. Along the same lines, a **lake effect snow watch** means that heavy lake effect snow is possible, a **blizzard watch** means that blizzard conditions are possible and a **wind chill watch** means that dangerously low wind chills are possible (cont'd on pg. 3).

SNOW SQUALLS

Snow squalls, with their sudden reduction in visibility from heavy snow and blowing snow, high winds and rapid snow accumulation can wreck havoc on our highways. In Pennsylvania, where snow squall-related accident statistics have been kept for the last 10 years, snow squalls have killed more people than tornadoes, lightning and much bigger snowstorms, including blizzards. Typically, snow squalls produce only a light accumulation of snow. But it only takes a small amount of snow under certain conditions for roads to become very slippery. In addition, the rapid, sudden reduction in visibility from the heavy snow and blowing snow takes motorists by surprise adding to the danger. Such snow squalls are a recipe for disaster along our highways where multiple car pile-ups can occur. An example of this was the tragic multiple car accident which took place January 6th 2004 along Interstate 80 in Milesburg, PA. A snow squall hit suddenly along Interstate 80 north of State College, PA causing a 37 vehicle pile-up with 20 tractor trailers involved. The photo to the right is from the Centre Daily Times and shows the deadly nature of such accidents.

Snow squalls are a scaled down version of summer-time thunderstorms.

In the photo to the left, you can easily see the anvil-like cloud structure similar to a summer-time thunderstorm. Such snow squalls typically form along arctic fronts in a similar way that thunderstorms form along cold fronts. NWS Doppler radar can detect snow squalls allowing forecasters to predict their arrival in a given area (cont'd on pg 4).

WINTER WEATHER SAFETY AND TERMINOLOGY (CONT'D)

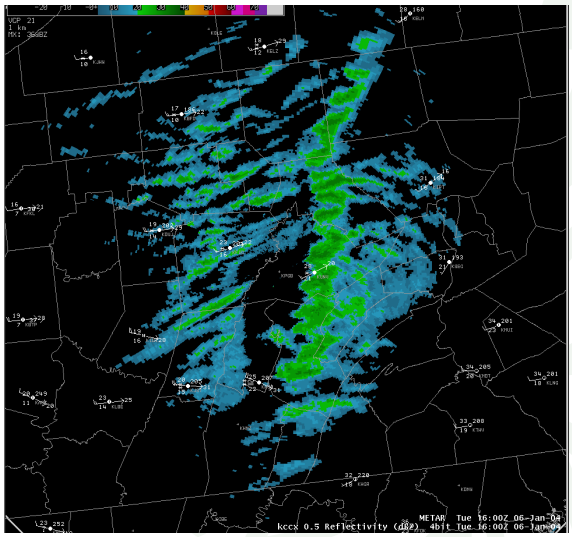
The leading cause of death during winter storms is transportation accidents.

A **winter storm warning** means that heavy snow, or a dangerous combination of snow, ice, wind and/or low wind chills is imminent or occurring in your area. Heavy snow is defined as an average of 7 inches of snow or more will fall in a 12 hour period or 9 inches of snow will fall in a 24 hour period. An **ice storm warning** is issued when damaging ice accumulations are imminent or occurring. The criteria for issuing ice storm warnings in northeast Pennsylvania and all of New York is ½ inch of ice accumulation. It is at ½ inch ice accumulation that trees and power lines begin to fall. A **blizzard warning** is issued when blizzard conditions are imminent or occurring. Blizzard conditions are defined as visibilities dropping to less than ¼ mile for 3 hours or more from heavy snow and blowing snow, with wind gusts frequently exceeding 35 mph. **Wind chill warnings** are issued when wind chills are expected to drop to -25°F or below.

Winter advisories are issued for hazardous winter weather conditions that are a nuisance and can be life-threatening if proper precautions are not taken. A **winter weather advisory** is issued when snowfall of around 4 inches is expected in a 12 hour period or for a hazardous combination of snow and ice that is expected to remain below warning criteria levels. A **freezing rain advisory** is issued for any light accumulation of ice that is expected. A **wind chill advisory** is issued for wind chills between -15°F and -24°F.

SNOW SQUALLS (CONT'D)

Below is a radar image of the Milesburg, PA snow squall on January 6th, 2004 .



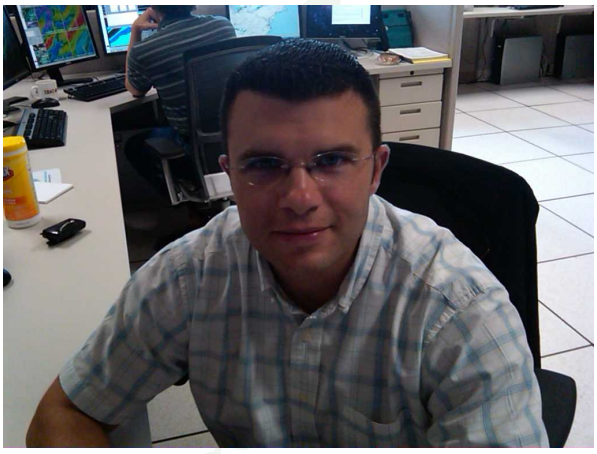
Predictions concerning the timing and locations of snow squalls help DOTs, the State Police, emergency management and the general public prepare for dangerous driving conditions. The DOT can pre-treat roads and put information on their message boards. The State Police can send squad cars out with flashing lights to alert motorists of the impending hazard. The public can make a decision not to travel or get off the highway until the squall passes. In this way, the impact of a dangerous snow squall can be lessened, saving lives and protecting people's property.

In order to facilitate the prediction of snow squalls and to make sure these predictions reach as many people and entities as possible, the NWS in Binghamton and State College will be issuing special weather statements that will activate the EAS and set off the alarms on SAME alert NOAA Weather Radios anytime a dangerous snow squall is threatening. The goal of these alerts is to provide advanced notice of the arrival of dangerous snow squalls. This in turn will no doubt help save lives and reduce the likelihood of major accidents on our highways.

'The NWS in Binghamton and State College will be issuing special weather statements that will activate the EAS and set off the alarms on SAME alert NOAA Weather Radios'

EMPLOYEE SPOTLIGHT - NWS BINGHAMTON'S NEWEST FORECASTER: CHRISTOPHER GITRO

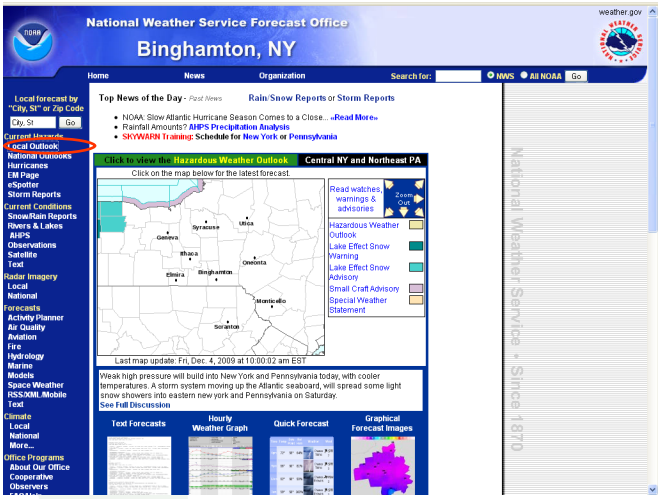
My name is Christopher Gitro and I come to the Binghamton, NY forecast office after having spent a year in Midland, TX. My wife and I are originally from the western NY region so we're both very happy to be closer to friends and family. I've been in the NWS for roughly 4 years now and I began my career at the Chicago, IL office as an intern. I felt very fortunate to have had the opportunity to spend some time in the Midwest as I was able to see many facets of weather, ranging from high impact severe and winter weather.



In Midland, I was introduced to the many complexities associated with fire weather forecasting as west Texas is mainly an arid climate that averages less than 15 inches of precipitation a year. However when I was in Midland, I realized just how much I missed winter weather forecasting and now that I'm once again in the Northeast, I couldn't be happier.

In my spare time, I enjoy spending time with my wife and 3 year-old son. Additionally, I enjoy weightlifting and running if time permits. I'm also a diehard Buffalo Sabres fan and I try to watch as many games as possible.

PRODUCT SPOTLIGHT: THE GRAPHICAL HAZARDOUS WEATHER OUTLOOK FOR ICE ACCUMULATION



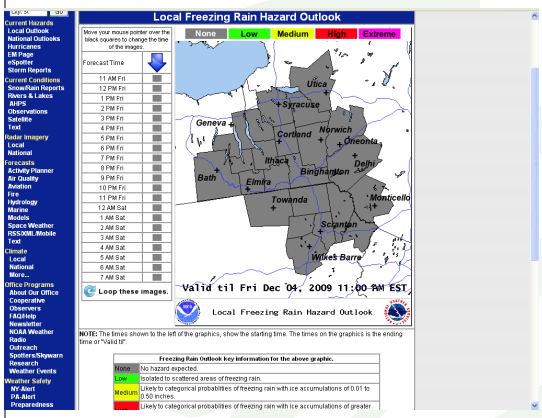
Recently, NWS Binghamton has expanded its graphical hazardous weather outlook (GHWO) for winter weather to include hourly ice accumulations. Let's take a closer look at this. First, to find this information, you need to begin at our main web page: http://weather.gov/bgm . To find our local hazardous weather outlook page, click on the first web link in the upper left below the **Local Forecast by "City, St" or Zip Code"** titled **Local Outlook** (see image to the right).

From there you will get the Hazardous Weather Outlook page and will then need to click on the "*Winter*" tab.

After clicking this link, you will see the "*Local Graphical Winter Hazards*."

The graphics you see are from the specific hour that the highest threat category is achieved. For instance, if at 3 pm we are expecting the heaviest snow intensity in the next 24 hours, this graphic will pop up. The highest wind chill threat graphic will show up and the hour of the highest ice accumulation will show up. In this way, the user can quickly see what the highest threats are for the next 24 hours. If you click on any of these graphics you will get the detailed hour-by-hour forecasts.

Now let's take a look at the ice accumulation or freezing rain forecast by clicking on the map above freezing rain.



When you mouse over the time periods you get the total accumulated ice by hour. In this way, you can see when ice accumulation exceeds certain thresholds and the expected hour that this will occur. You can also loop the images. The categories are: "none" which of course means no freezing rain expected, "low" equals isolated to scattered areas of freezing rain, medium equates to .01 to .50 inches of ice accumulation expected, "high" equals between .50 to 1 inch ice accumulation, and "extreme" which means greater than 1 inch of ice accumulation.

It is important to remember that the hourly graphics are the running total of ice accumulation from an ice storm. The idea is to give customers the time at which widespread icing will occur (medium), when ice will cross the ½ inch criteria (the threshold for when trees and power lines are damaged) and 1 inch (catastrophic damage can be anticipated).

Below is the table that describes the "none", "low", "medium", "high" and "extreme" from our web page.

Freezing Rain Outlook key information for the above graphic.	
None	No hazard expected.
Low	Isolated to scattered areas of freezing rain.
Medium	Likely to categorical probablities of freezing rain with ice accumulations of 0.01 to 0.50 inches.
High	Likely to categorical probablities of freezing rain with ice accumulations of greater than 0.50 to less than 1.00 inch.
Extreme	Likely to categorical probablities of freezing rain with ice accumulations greater than or equal to 1.00 inch.

If you have any feedback, suggestions or comments on this new web forecast, please email me at david.nicosia@noaa.gov We hope you will find this new forecast useful!

THE CHALLENGES OF WINTER WEATHER FORECASTING

BY: CHRISTOPHER GITRO, FORECASTER

Along with severe weather forecasting, winter weather forecasting poses one of the biggest challenges to any meteorologist who is preparing a forecast. Not only does a forecaster have to decide the form of precipitation and how much, but additional concerns must be given consideration such as the time of day, time of year, and to whom the event will impact the most. For example, if a forecaster is trying to decide whether to issue a winter weather advisory or not, an early first of the year snowfall event may have a greater likelihood of having an advisory issued as opposed to a marginal event in the dead of winter when everyone is accustomed to such conditions. This short article will take a brief look at some of the methods and considerations a meteorologist must take into account when preparing winter weather forecasts. We'll touch on some of the common winter weather signatures associated with freezing rain, sleet, and all snow events. This article is by no means all inclusive; however it serves as just a brief introduction to what a forecaster may be looking for with regards to winter precipitation.

Freezing Rain

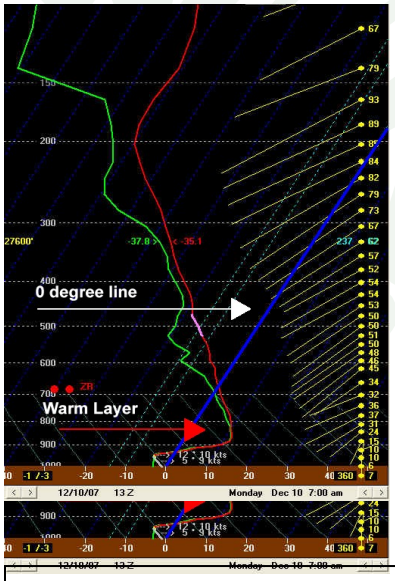


Figure 1: WRF 12z Bufkit forecast valid at 13z December 10, 2007 for Tulsa, OK International Airport.

This destructive and potentially dangerous form of precipitation forms when temperatures at the Earth's surface are below freezing, while air just above the ground is above freezing. Most precipitation in the United States starts out as snow as it forms in clouds, even in the summer time! During a freezing rain scenario, as the snow falls through the elevated warm layer, the snow flakes melt into liquid raindrops. The liquid raindrops will then continue falling into the shallow cold layer residing along the Earth's surface. Often times, this shallow cold layer is not thick enough to support refreezing, and as the raindrops hit the ground, they instantly freeze into a layer of ice.

These weather events are one of the most beautiful and destructive weather elements Mother Nature has to offer. Although one often finds themselves staring at trees and other objects covered in shiny layers of fresh ice, the increased weight from the ice causes catastrophic tree and power line failures. One of the most destructive ice storms in recent memory occurred across northern NY, northern New England, and southeastern Canada where up to 4 inches of freezing rain fell over a 6 day period. When the event was over, 32 deaths were attributed to the storm as well as knocking out power to more than 5 millions US and Canadian customers.

Some common thermodynamic signatures indicative of freezing rain are the elevated warm layer and surface cold layer. The example at left is a forecast thermodynamic profile which shows the vertical structure of temperature (red) and dewpoint (green) through the depth of the atmosphere. This forecast depiction of what the vertical structure of temperature and dewpoint would look like in the future was taken from the Tulsa, OK metro area, shortly before the devastating ice storm of early Dec 2007. One can see an expansive area of warm air above 0°C above the surface. Meanwhile, along the surface, temperatures were below the 0°C line indicating that a shallow cold layer at the Earth's surface existed. Precipitation falling through the elevated warm layer melted into liquid raindrops, which essentially froze on contact when they hit the Earth's surface. As a result of this ice storm, hundreds of thousands of citizens were without power, making this event the single most catastrophic ice storm in OK history as more people were without power than any other time in OK state history (cont'd).

THE CHALLENGES OF WINTER WEATHER FORECASTING (CONT'D)

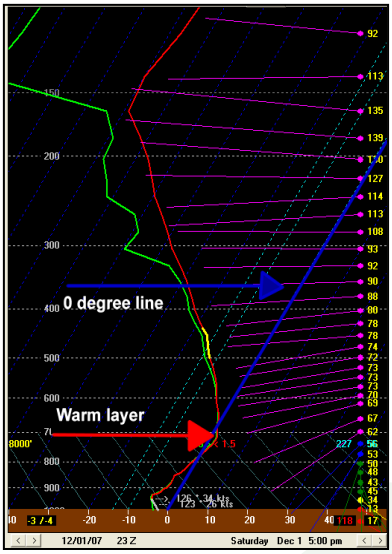


Figure 2: WRF 12z Bufkit forecast valid at 23z December 1, 2007 at Rockford, IL Airport.

Sleet

Another type of freezing precipitation that is of a concern to a meteorologist, as well as the general public is sleet. Sleet by definition is a form of precipitation that travels through an elevated warm layer similar to freezing rain. However the main difference is that the elevated warm layer is usually not as warm as in freezing rain events, leading to only partial melting of the precipitation particle. For sleet to form, the air along and immediately above the surface needs to be below freezing which will promote only partial refreezing of the particle before it strikes the Earth's surface. Upon striking the surface, sleet particles often times bounce or shatter on impact. Sleet can also make area roadways and other transportation thoroughfares very slippery thereby creating another challenging forecast scenario for any forecaster.

Common thermodynamic signatures indicative of sleet are similar to signatures supportive of freezing rain, however the elevated warm layer is usually between 1 to 3°C above zero. Any temperatures warmer than 3°C would promote total melting and a greater likelihood for freezing rain as opposed to sleet. Again, as is in the case for freezing rain events, surface temperatures must be at or below freezing in order to assist in partial refreezing of the precipitation particle as they enter the surface cold layer.

Snow

The most common and easily recognizable form of precipitation in the winter time is snow. Without doubt, anyone accustomed to winter in the Great Lakes region has had their faring share of dealing with snow storms. From a thermodynamic point of view, snow forecast soundings are easily recognizable since for the majority of cases, the entire atmospheric column is below 0°C. Careful inspection of the sounding is critical however, as one must determine if the column will support effective ice nucleation and snow growth. Typically, the most effective snowfall production occurs when the atmosphere is saturated (temperature and dewpoint are equal) between -12 to 18°C. At these temperatures, snow growth reaches its peak as ice crystal growth maximizes through a process called deposition. Supercooled water droplets are actual water droplets in the atmosphere that maintain their liquid form below temperatures of 0°C. As the atmospheric temperature approaches the -15°C area, ice crystals grow as supercooled water droplets are removed through the process called deposition.

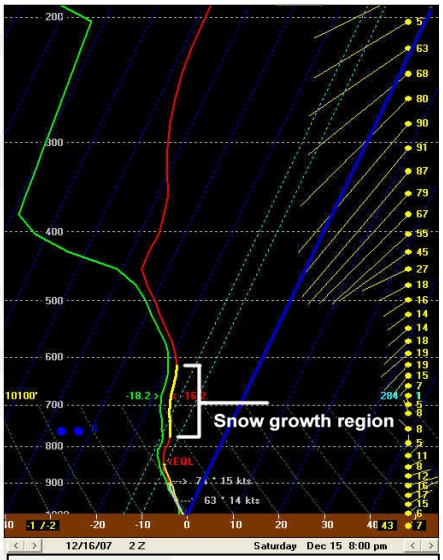


Figure 3: WRF 12z Bufkit forecast valid at 02z December 15, 2007 at Chicago OHare International Airport.

Conclusion

As one can see from reading this short article, winter weather forecasting is one of the most difficult scenarios any forecasting meteorologist will face during his/her career. The thermodynamic structure of the atmosphere must be investigated in order to determine which type of precipitation is most likely, whether it be freezing precipitation which freezes on contact with the Earth's surface such as freezing rain, or frozen precipitation such as snow. Other potential issues for winter weather forecasting not specifically mentioned in this short article include lake effect snow forecasting, in which temperature differences between the lake water temperature and the overlaying air can create areas of enhanced instability, resulting in very heavy snowfall across areas adjacent to and directly downstream of a major lake. Recent lake effect snow storms in portions of Upstate NY have resulted in snowfall rates of 3 to 4 inches per hour, oftentimes accompanied with thunder and lightning, a shear measure of the extreme instability present in the atmosphere.

Although this short article is by no means all inclusive, it will hopefully shed some light on just how difficult winter weather forecasting may be.

Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service Binghamton NY

Greater Binghamton Airport
32 Dawes Drive
Johnson City, NY 13790

Phone: 607-770-9531
Fax: 607-798-6624
E-mail: david.nicosia@noaa.gov

On the Web at:
http://weather.gov/bgm

National Weather Service Mission

"The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community."

UPCOMING OUTREACH AND SKYWARN

Basic SKYWARN training session, January 19th, 2010, 7-9 pm EST hosted by the New York National Guard. Location: 28 Hill Street, Oneonta, NY 13820. Speaker: David Nicosia, Warning Coordination Meteorologist.

Floods of the Southern Tier Presentation January 12th, 2010, 7-8 pm EST hosted by the Endicott Historical Society. Location: 407 E. Main St, Endicott, NY. Speaker: David Nicosia, Warning Coordination Meteorologist

Advanced SKYWARN training session, February 2nd, 2010, 7-9 pm EST hosted by the New York National Guard. Location: 28 Hill Street, Oneonta, NY 13820. Speaker: David Nicosia, Warning Coordination Meteorologist.